

CASH MANAGEMENT SYSTEM INTERFACEField of the Invention

The present invention relates to interfaces for cash management systems, and particularly to a point-of-sale interface for a cash management system of the type that accepts cash deposits and dispenses cash, such as paper money and rolls of coins.

Background of the Invention

Cash management systems are known. U.S. Patent Application No. 09/228,719, for example, describes an exemplary that includes bill verifier and stacker units, a bill dispenser, a card reader, a key pad input, a display output, a printer, and a modem. Such systems are useful in retail operations where it is desirable both to limit the amount of cash available to employees and to provide the ability to obtain various denominations of coins or bills as needed.

In addition to using cash management systems, retail operations typically include a point-of-sale (P. O. S.) system that is separate from the cash management system. A typical P. O. S. system can include a main computer that is coupled to various other P. O. S. devices such as cash registers, bar code scanners, etc. The P. O. S. system illustratively includes a computer which, according to the invention, is coupled to the cash management system by a communication link, such as an RS-485 serial interface. The cash management system is integrated with the P. O. S. system according to various aspects of the present invention. Software is provided on both the P. O. S. and cash management systems, so that functions of the cash management system are integrated with the P. O. S. system.

Disclosure of the Invention

A cash management system interface method and apparatus according to the present invention can include one or more of the following features:

providing a communication interface to couple a P.O.S. system to a cash management system;

providing software on a cash management system to allow for operation of the cash management system over a communication link from a remote device;

5 providing software on a P.O.S. system to allow for control of a remote cash management system over a communication link;

providing a graphical user interface on a P.O.S. system for control of a cash management system;

defining data formats for communicating information between a cash management system and a P.O.S. system;

10 providing a diagnostic menu interface to a cash management system;

providing a setup menu interface to a cash management system;

controlling a cash management system over a modem; and

controlling a cash management system over a wide-area network

#### 15 Brief Description of the Drawings

The invention may best be understood by referring to the following detailed description and accompanying drawings which illustrate the invention. In the drawings:

Fig. 1 illustrates a block diagram of a cash management system  
20 integrated into a point-of-sale system;

Figs. 2-12 illustrate displays which are produced on an integrated P. O. S. system/cash management system of the type illustrated in Fig. 1; and,

Figs. 13-14 illustrate flow diagrams of various communications between, and actions by, the P. O. S. system and cash management system of an  
25 integrated P. O. S. system/cash management system of the type illustrated in Fig. 1.

#### Detailed Descriptions of Illustrative Embodiments

A cash management system can be integrated with a P. O. S. system as illustrated in the block diagram in Fig. 1, the illustrative display screens illustrated in  
30 Figs. 2-12, and the interface flow diagram illustrated in Figs. 13-14. Cash management system 10 includes a user interface 12, such as a keyboard and display as described in, for example, U.S. Patent Application No. 09/228,719, as well as other controlled

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devices such as rolled coin dispensers 14, bill verifier and stacker units 16, a printer 18, a card reader 20, etc. Cash management system 10 includes an interface 22, illustratively an RS-485 serial communication link, for communicating with a P. O. S. system 24. P. O. S. system 24 includes a corresponding RS-485 interface 26 to the cash management system, as well as its own user interface 28, illustratively a monitor, keyboard, and mouse-driven interface such as provided on a typical Windows™ personal computer.

Including the interfaces 22, 26 in the cash management system 10 and P. O. S. system 24, respectively, permits the P. O. S. system user interface 28 to incorporate or integrate the features of the cash management system user interface 12 into the P. O. S. system 24. Thus, for example, a Windows-based emulation of the user interface 12 can be provided as illustrated in Figs. 2-12. The system displays illustrated in Figs. 2-12 provide a graphical representation of the keypad, buttons, and display of user interface 12. Although a separate emulation of cash management system user interface 12 is provided on P. O. S. system 24, this functionality can be incorporated into an existing user interface or provided in any other convenient manner. Furthermore, the P. O. S. system 24 can utilize the functionality of the cash management system interface 12 in any manner desired. For example, data included in the emulated printer report illustrated in Fig. 2 can be electronically captured on P. O. S. system 24 for further processing or dissemination as desired.

Figs. 2-12 illustrate various features of cash management system 10 as provided on its user interface 12 or remotely on P. O. S. system user interface 28. Thus, for example as illustrated in Fig. 3, cash management system 10 provides diagnostic functions that can be provided remotely on P. O. S. system 24. When interfaces 22, 26 are configured to use a modem interface, cellemetry interface, or World Wide Web-based interface, diagnostics for a cash management system 10 in one location can be run from a P. O. S. system 24 at another location anywhere in the world.

Referring now to Figs. 13-14, the P. O. S. system 24 computer and a cash management system 10 such as, for example, an Autovend RMS Model 102 or 103 system, CMS Model 300 or 301, or CDS Model 600, 601 or 602, all available from Autovend, Inc., 6635 East 30<sup>th</sup> Street, Suite A, Indianapolis, Indiana 46219, both

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wait for data. If the cash management system 10 receives data, it performs one of the following operations: it disconnects, breaking its connection with the computer; it disables its keypad and display and displays a "privacy mode on" message; it reenables its keypad and display and displays a "privacy mode off" message; it receives data  
5 telling it that when it receives a command to print from the computer, it must print to its own associated printer, the P. O. S. system 24's computer, or both; it returns a string of data that tells the P. O. S. system 24 that the P. O. S. system 24 and the cash management system 10 are still connected; it receives a key which is loaded into the keyboard buffer. This is interpreted by the cash management system 10 as a command  
10 from its keypad. However, the cash management system 10 recognizes the source of this input so that it knows to print to the P. O. S. system 24's selected printer. After each of these operations, the cash management system 10 returns to wait for data.

Referring to Fig. 14, if the P. O. S. system 24 receives data, it performs one of the following operations: it clears its display buffer and sets its cursor position  
15 to 0.0; it receives a data string containing the x and y coordinates of its cursor, and moves its cursor to this position; it makes its cursor visible on its display; it makes its cursor invisible on its display; it displays the next character that is sent to the P. O. S. system 24 in the printer window; it displays the next character that is sent to the P. O. S. system 24 in the display window at the current cursor position; after the P. O. S.  
20 system 24's computer remains idle for two seconds without receiving any data from the cash management system 10, the P. O. S. system 24's computer checks to verify if the cash management system 10 is still connected. If the cash management system 10 is still connected, the cash management system 10 sends an acknowledgment that it is still connected. If the P. O. S. system 24's computer commands the cash management  
25 system 10 to connect to it, the cash management system 10 either sends an acknowledgment, and the cash management system 10 and P. O. S. system 24 wait for data, or the P. O. S. system 24 does not receive an acknowledgment from the cash management system 10, in which case the P. O. S. system 24 may continue to send a connect command until a connection is established, or an attempt to establish a  
30 connection is terminated.

A description of an illustrative communication protocol between a cash management system 10 and P.O.S. system 24 follows. Such a protocol includes a

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command string that the P. O. S. system 24 sends to the cash management system 10, telling the cash management system 10 what to do. All strings follow the same format. The illustrative command string includes one or more dummy characters (#1) plus a start command character (#2) plus one or more command characters plus an end command character (#3). When the cash management system 10 checks its serial buffer, it looks for a dummy character. When it finds one, it will continue to read until it finds a start character. It then reads the command character(s). Illustrative characters which are sent by the cash management system 10 and P.O.S. system 24 are contained in Tables 1 and 2, respectively.

Table 1

ASCII Code	Meaning
5	Error: Could not get report because pedestal was busy
6	Error: Report is unavailable with this system
14	Turn off cursor
15	Receive cursor position
16	Turn on cursor
20	End receive cursor position
21	Start receiving text
22	End receiving text
23	Clear display
27	Successfully connected
30	Flush buffer
153	Report sent. Move on to next report
200	Start receiving text for printer
201	End receiving text for printer
202	Machine successfully received command
205	Begin downloading quick reports
206	Error: You must be on a menu screen to use Quick Reports

	207	Passcode failed for Quick Reports. Redraw display.
	208	Error: The password you entered is incorrect
	216	Error: You cannot vend coins from a remote location
	217	Error: You cannot open the door from a remote location
5	218	Error: You cannot add or remove money from a remote location
	219	Error: You cannot do a drawer vend from a remote location
	220	Error: You cannot use the envelope drop from a remote location

Table 2

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ASCII Code	Meaning
113	Connect
48	Key 0
49	Key 1
50	Key 2
51	Key 3
52	Key 4
53	Key 5
54	Key 6
55	Key 7
56	Key 8
57	Key 9
97	Menu Key
98	Delete Key
99	Arrow Key 1
100	Arrow Key 2
101	Arrow Key 3
102	Arrow Key 4
103	Arrow Key 5

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	104	Arrow Key 6
	105	Arrow Key 7
	106	Arrow Key 8
	107	Privacy Mode On
5	108	Privacy Mode Off
	109	Print To Cash Management System Printer
	110	Print To P. O. S. System Printer
	111	Print To both Printers
	112	Get Display and send to P. O. S. System
10	114	Disconnect
	116	Inventory Report (Quick Reports)
	117	Change Fund Report (Quick Reports)
	118	Business Day Report (Quick Reports)
	119	Activity Report (Quick Reports)
15	120	Request Quick Reports
	202	Confirm that buffer has been flushed

The cash management system 10 stops checking the buffer when it receives the end command character. The purpose of the dummy characters is that the cash management system 10 may be busy checking one of its associated devices, such as a bill reader, so a long enough string of characters should be sent to provide a reasonable opportunity for the cash management system 10 to find the transmitted data. Of course, even with this scheme, there is a possibility that the cash management system 10 will miss the transmitted data. Therefore, the P. O. S. system 24 continues to send the command string until it receives an acknowledgment character, or until a timeout occurs. Upon receipt of a command, the cash management system 10 acknowledges that it received the command, illustratively by sending ASCII code 202.

In order to connect to the cash management system 10, the P. O. S. system 24 illustratively first sends a connect command to the cash management system 10. The illustrative connect command includes the connect character and a 12 character password. The cash management system 10 responds to this connect

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command with a "connected" acknowledgment or with a bad password. No communication can ensue unless the "connected" acknowledgment is received. Once the P. O. S. system 24 and cash management system 10 are connected, the P. O. S. system 24 sends a "get display" command. When the cash management system 10 receives this command, it reads the display buffer and outputs it to the P. O. S. system 24. Next, the P. O. S. system 24 sends the cash management system 10's printer location, for example, the cash management system 10's own dedicated printer, a PC window, or both, to the cash management system 10.

Whenever the P. O. S. system 24 ceases communication with the cash management system 10, the P. O. S. system 24 sends the "disconnect" command. The cash management system 10 then ceases communication with the P. O. S. system 24.

The P. O. S. system 24 emulates the cash management system 10's display by changing the display window at the same time and in the same way as the display on the cash management system 10 is changed. For example, when the display on the cash management system 10 is cleared, the cash management system 10 sends a "clear display" command to the P. O. S. system 24, and the P. O. S. system 24's display is cleared as well. The cursor position, and cursor status are changed in the same way. When text is received, it is sent to the screen at the current cursor position. The cursor's x value is then incremented. When the x value exceeds the display's limits, the cursor's x value is set to 0 and its y value is incremented.

When the P. O. S. system 24 receives a "print" command, all following characters are sent to the P. O. S. system 24's printer window until the "end print" command is received.

When a key on the P. O. S. system 24's keypad is pressed, the P. O. S. system 24 sends a command string containing a character representing that key. When the cash management system 10 receives the command, it converts the character to the equivalent code that the cash management system 10's keypad sends to its central processing unit. That code is then placed in the keyboard buffer, causing the cash management system 10 to treat the code as though it had been received from its own keypad. The cash management system 10 also remembers where the last keypress came from so that it knows where to print to next.

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When the P. O. S. system 24 sends a "quick reports" command, if the cash management system 10 is not on a menu screen it will send back an acknowledgment that the operator must be on a menu screen to use the "quick reports" command. If the cash management system 10 is on a menu screen, it will request the operator's personal identification number, or PIN. If the operator responds with an incorrect PIN, the cash management system 10 acknowledges by canceling the "quick reports" command. If the operator responds with a correct PIN, the cash management system 10 acknowledges with a "proceed" command. The P. O. S. system 24 acknowledges with a request for each report it wants. If there is an error in the report request, the cash management system 10 identifies the error to the P. O. S. system 24 so that the P. O. S. system 24 can display an appropriate message to the operator. Upon the successful transmission of a requested report, the cash management system 10 sends a "ready" to notify the P. O. S. system 24 that the cash management system 10 is ready for the next command.

When the "privacy mode" feature is turned on, output from the P. O. S. system 24 to the cash management system 10 is ignored. Data is only sent from the cash management system 10 to the P. O. S. system 24. When "privacy mode" is turned off, output from the P. O. S. system 24 to the cash management system 10 resumes. In the event the cash management system 10 becomes disconnected from the P. O. S. system 24, privacy mode is turned off.

All data received which is between ASCII code 21 and ASCII code 22 is outputted to display beginning at the current cursor position. A sample data string to display would then be "#21DISPENSER EMPTY#22."

All data received which is between ASCII code 200 and ASCII code 201 is outputted to the printer. A sample data string to the printer would then be "#200DEPOSIT RECEIPT#13USER: 111#1311/13/98 2:00 PM#13BILL READER A: \$15.00#13#13#13#201."

All data received which is between ASCII code 15 and ASCII code 20 contains the x and y coordinates of the cursor location. The first number is the y coordinate. A sample data string containing a cursor location would then be "#15112#20. This would correspond to the x.y cursor coordinates 12.1.

After receiving ASCII code 113 plus a space-padded 12 character password, the cash management system 10 will send back to the P. O. S. system 24 either ASCII code 208, if the password is incorrect, or ASCII code 27, if the password is correct. If the P. O. S. system 24 receives 27, the P. O. S. system 24 responds with ASCII code 112, commanding the cash management system 10 to get its display and send it to the P. O. S. system 24. The P. O. S. system 24 then sends ASCII code 109, 110 or 111, depending on the location to which it wants the display sent. A sample of this communication would then be:

P. O. S. system 24: "#1#1#1#1#1#1#1#1#1#1#1#1#1#1#1#2#113Ferrari #3"  
cash management system 10: "#202#27."

P. O. S. system 24: “#1#1#1#1#1#1#1#1#1#1#1#1#1#1#1#1#2#1#2#3.”

15 The cash management system 10 then sends its cursor position and display text. The P. O. S. system 24 then responds by sending  
“#1#1#1#1#1#1#1#1#1#1#1#1#1#1#1#1#2#110#3.”

When the P. O. S. system 24 receives ASCII code 16, it turns the cursor on. When it receives ASCII code 14, it turns the cursor off. When ASCII code 23 is received, the display area is cleared and the cursor position is set to 0.0. As the buffer nears full, the cash management system 10 sends ASCII code 30 to the P. O. S. system 24. The P. O. S. system 24 clears its receive buffer and then sends ASCII code 202, telling the cash management system 10 to resume communication. A sample of this communication would then be:

25 cash management system 10: “#30”  
P. O. S. system 24: “#202.”

In an illustrative protocol for obtaining quick reports, the P. O. S. system 24 sends ASCII code 120 to the cash management system 10. The cash management system 10 responds by sending ASCII code 206 if it is not on a main menu. If it is on a main menu, it will display the PIN code screen. If a valid PIN code is entered, the cash management system 10 will respond will ASCII code 205.

5 would then be:

cash management system 10: “#205 (displays PIN code screen and receives a valid  
10 code)”

P. O. S. system 24: “#1#1#1#1#1#1#1#1#1#1#1#1#1#1#1#2#117#3”

cash management system 10: “#153 (finished sending report to designated printer).”

Each time the cash management system 10 receives a command other than ASCII code 202, it responds with ASCII code 202, confirming receipt of the command. The cash management system 10 sends an error message, ASCII code 5, when it cannot fulfill a request.